

ARTICLE 925

STORM WATER MANAGEMENT REGULATIONS

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CROSS REFERENCES

Tapping fee - See 3rd Class S3202(53 P.S. S38202)
Department of Public Works - See ADM Art. 107
Sewer rental - See S.U. & P.S. Art. 927
Privies and cesspools - See HLTH. Art. 1163
Garbage disposals emptying into sewer system - See BLD. Art. 1717

925.01 APPLICABILITY

The following activities shall be subject to these regulations when they create more than 10,000 sq.ft. of additional impervious surfaces. Activities which create less than 10,000 sq. ft. of additional impervious surfaces shall also be subject to these regulations, if in the opinion of the City Engineer, compliance with these regulations is necessary to prevent the occurrence or exacerbation of storm water or erosion control problems on a local level. Also, sections 925.03(h)"Erosion Control" and 925.03(j)"Sinkhole Prevention", 925.03(k) "Concrete Block Retaining Walls", and 925.03(1) NPDES Permit apply regardless of any onsite activity or area of additional impervious surfaces created. Activities under items "i" & "j" below shall be subject to these regulations regardless of the area of additional impervious surfaces created.

- (a) Land development.
- (b) Subdivision.
- (c) Construction of new or additional impervious surfaces(driveways, parking lots, etc.).
- (d) Construction of new buildings or additions to existing buildings, including residential construction.

- (e) Earthmoving.
- (f) Agricultural operations.
- (g) Forest management operations.
- (h) Nursery operations.
- (i) Diversion or piping of any natural or man-made watercourse.
- (j) Installation of storm water systems or appurtenances thereto.

925.02 DEFINITIONS

The following words, terms and phrases when used in this Article shall have the meaning ascribed to them in this section, unless the context clearly indicates a different meaning.

- (a) Act 167 - Act of October 4, 1978, P.L. 864, the "Storm Water Management Act."
- (b) Cistern - An underground reservoir or tank for storing rainwater.
- (c) City - City of Bethlehem.
- (d) Conservation District - The Northampton County Conservation District or Lehigh County Conservation District, as applicable.
- (e) Culvert - A pipe, conduit or similar structure including appurtenant works which carries surface water.
- (f) Dam - Any artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or any other fluid or semifluid or any refuse bank, fill, or structure for highway, railroad or other purposes which does or may impound water or any other fluid or semifluid.
- (g) Design Storm - The magnitude of precipitation from a storm event measured in probability of occurrence (e.g., 50 yr. storm) and duration (e.g. 24-hour), and used in computing storm water management control systems.

- (h) Detention Basin - A basin designed to retard storm water runoff by temporarily storing the runoff and releasing it at a predetermined rate.
- (i) Developer - A person, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, that undertakes any applicable activity of this ordinance.
- (j) Development Site - The specific tract of land for which a Regulated Activity is proposed.
- (k) Drainage Easement - A right granted by a land owner to a grantee, allowing the use of private land for storm water management purposes.
- (l) Drainage Plan - The documentation of the proposed storm water management controls, if any, to be used for a given development site, the contents of which are established in section 925.07.
- (m) Erosion - The removal of soil particles by the action of water, wind, ice, or other geological agents.
- (o) Freeboard - The incremental depth in a storm water management structure, provided as a safety factor of design, above that required to convey the design runoff event.
- (p) Groundwater Recharge - Replenishment of existing natural underground water supplies.
- (q) Impervious Surface - A surface which prevents the percolation of water into the ground.
- (r) Infiltration Structure - A structure designed to direct runoff into the ground, e.g. french drain, seepage pit or seepage trench.
- (s) LVPC - Lehigh Valley Planning Commission.
- (t) Land Development - (i) the improvement of one lot or more contiguous lots, tracts or parcels of land for any purpose involving (a) two or more buildings, or (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups or other features, or (c) a proposed single lot single structure development where, in the opinion of the City Engineer, the impact and intensity of the Land Development

warrants review by the City Planning Commission, and
(ii) a subdivision of land.

- (u) Mainstem (main channel) - Any stream segment or other runoff conveyance facility used as a reach in the watershed plan hydrologic models.
- (v) Manning Equation (Manning formula) - A method for calculation of velocity of flow (e.g. feet per second) and flow rate (e.g. cubic feet per second) in open channels based upon channel shape, roughness, depth of flow and slope. "Open channels" may include closed conduits so long as the flow is not under pressure.
- (w) Municipality - City of Bethlehem, Lehigh or Northampton County, Pennsylvania.
- (x) NPDES Permit - National Pollutant Discharge Elimination System Permit.
- (y) NRCS - Natural Resource Conservation Service - U.S. Department of Agriculture. (Formerly the Soil Conservation Service.)
- (z) Open Channel - Any water(usually storm water) conveyance facility through which water normally flows by gravity. An open channel may be exposed, such as a swale, street gutter, or stream; or unexposed(or closed), such as a storm sewer pipe or box culvert.
- (aa) PSU-IV - computer modeling technique used to model many of the subareas of the Lehigh River Sub-Basin 4 Watershed.
- (bb) Peak Discharge - The maximum rate of flow of storm runoff at a given point and time resulting from a specified storm event.
- (cc) Penn State Runoff Model (calibrated) - The computer-based hydrologic modeling technique adapted to the watersheds for the Act 167 Plans. The model has been "calibrated" to reflect actual recorded flow values by adjusting key model input parameters.
- (dd) Rational Method - A method of peak runoff calculation using a standardized runoff coefficient (rational 'c'), acreage of tract and rainfall intensity determined by return period and by the time necessary for the entire tract to contribute runoff. The rational formula is stated as follows: $Q = ciA$, where "Q" is the calculated peak flow rate in cubic feet per second, "c"

is the dimensionless runoff coefficient(see the current issue of the storm water design policy of the Department of Public Works), "i" is the rainfall intensity in inches per hour, and "A" is the area of the tract in acres.

- (ee) Reach - Any natural or man-made runoff conveyance channels used for modeling purposes to connect the subareas and transport flows downstream.
- (ff) Regulated Activities - Actions or proposed actions which impact upon proper management of storm water runoff and which are governed by this ordinance as specified in Section 925.01.
- (gg) Release Rate - The percentage of the predevelopment peak rate of runoff for a development site to which the post-development peak rate of runoff must be controlled to protect downstream areas.
- (hh) Return period - The average interval in years over which an event of a given magnitude can be expected to recur. For example, the twenty-five (25) year return period rainfall or runoff event would be expected to recur on the average once every twenty-five years.
- (ii) Runoff - That part of precipitation which flows over the land.
- (jj) SCS - Soil Conservation Service, U.S. Department of Agriculture.
- (kk) Seepage Pit/Seepage Trench - An area of excavated earth filled with loose stone or similar material and into which surface water is directed for infiltration into the ground.
- (ll) Soil-Cover-Complex Method - A method of runoff computation developed by SCS which is based upon relating soil type and land use/cover to a runoff parameter called a Curve Number.
- (mm) Storage Indication Method - A reservoir routing procedure based on solution of the continuity equation (inflow minus outflow equals the change in storage for a given time interval) and based on outflow being a unique function of storage volume.
- (nn) Storm Sewer - A system of pipes or other conduits which carries intercepted surface runoff, street water and other wash waters, or drainage, but excludes

domestic sewage and industrial wastes.

- (oo) Storm Water Management Plan - The plan for managing storm water runoff adopted by Northampton and Lehigh Counties for watersheds as required by the Act of October 4, 1978, P.L. 864, (Act 167), and known as the "Storm Water Management Act". The storm water management plans incorporated in this ordinance are the Monocacy Creek Watershed Plan, the Nancy Run Watershed Plan, the Saucon Creek Watershed Plan, and the Catasauqua Creek and Lehigh River Sub-Basin 4 Watershed Plan. The latter watershed plan is the most recent and contains some revisions of the former watershed plans. Most of these revisions have been incorporated into this ordinance and, except for detention requirements, are to be understood as revisions to the former three watershed plans.
- (pp) Stream - A watercourse.
- (qq) Subarea - The smallest unit of watershed breakdown for hydrologic modeling purposes for which the runoff control criteria have been established in the Storm Water Management Plan.
- (rr) Subdivision - The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land including changes in existing lot lines for the purpose, whether immediate or future, of lease, transfer of ownership or building or lot development.
- (ss) Swale - A low lying stretch of land which gathers or carries surface water runoff.
- (tt) Watercourse - Any channel of conveyance of surface water, whether natural or artificial, with perennial or intermittent flow.

925.03 GENERAL STORM WATER REGULATIONS

- (a) Storm Drainage Systems - General
 - (1) All storm drainage systems shall be constructed as necessary to convey the flow of surface waters without damage to persons or property. These drainage systems shall be constructed as approved by the City Engineer to drain the storm water runoff from the applicant's land, as well as the collected runoff from development(s) at higher elevations in the same watershed. Should the land

at a higher elevation be undeveloped, the design of the storm drainage system local to the applicant shall be designed as if the land above were fully developed in accordance with current zoning regulations and assuming required runoff controls in effect in all tributary areas.

- (2) Storm drainage systems shall, among other requirements, (a) permit unimpeded flow of natural watercourses except as modified by storm water detention facilities or open channels consistent with this ordinance; (b) provide positive drainage away from buildings and on-site sewage disposal systems; and (c) prevent overloading of downstream drainage systems and watercourses as a result of increased rate of runoff caused by the proposed development.
- (3) The developer shall ensure that current as-built records are maintained during construction. Upon completion of construction, Certified(i.e. P.E. Stamped) as-built drawings shall be submitted by the developer's engineers. These as-built drawings shall be found acceptable by the City Engineer prior to release of any remaining security. The City retains the option to require the final as-built data to be in a digitized computer form.
- (4) In order to maintain continuity between plan revisions, any changes to a previous plan submission shall be flagged with a triangle. Any changes not flagged may be considered not approved. Flagged changes that have been documented shall be referenced to the appropriate revision date.
- (5) The City Engineer may require that drainage swales within 100 feet of a water transmission line be lined with a 6-inch thick clay liner having a permeability of 1×10^{-7} cm/sec. or less. This clay liner would, in turn, be covered by a 6-inch layer of viable topsoil on which a healthy growth of grass shall be established(unless rip-rapped). Alternatively, the City Engineer may require that a storm sewer pipe system be used, instead of a swale, within 100 feet of a water transmission main, especially when crossing the water line.
- (6) No person shall discharge into any watercourse within the City, or in any area under the

jurisdiction of the City, any sewage or other pollution waters or industrial waste, except as hereinafter provided.

- (7) Residential, commercial or industrial property may be connected to the storm sewer system providing the waste to be discharged thereto conforms to the following:

- A. All discharge of waste to storm sewers shall be in compliance with the laws or regulations of the Commonwealth of Pennsylvania or the Federal Government or any agency thereof having jurisdiction over streams, rivers, waterways, or water resources.
- B. No waste other than unadulterated rain, roof, or surface drainage water or authorized industrial waste shall be discharged into a storm sewer.
- C. No storm water runoff, natural drainage or authorized industrial waste shall be so diverted as to overload existing drainage systems, or create flooding or the need for additional drainage structures on other private properties or public lands, without City approved provisions being made by the developer for properly handling such conditions.

- (8) Drainage of Swimming Pools

Refer to Article 921, Sanitary Sewer Regulations(Section 921.05 - Drainage of Swimming Pools).

- (9) Storm Water Flow Impedances

No storm water drainage system, including detention and retention ponds, catch basins, swales, pipes, etc., shall, with the exception of natural causes, have the water flow impeded in any manner, such as by the construction or erection of any structure, placing or dumping of dirt, leaves, grass, debris, etc., or the parking of vehicles or equipment that in any way causes a pond or channel flow to be restricted, except for properly operating design outlet structures of detention or retention ponds.

(10) Improvement Specifications

The City Engineer may supply additional specifications necessary for the spacing and type of inlets and manholes, minimum pipe sizes, and materials and construction methods.

(b) Storm water Discharge to A Deficient Channel

Should it be evident that an offsite storm water drainage channel, into which a developer desires to discharge postdevelopment storm water at a flow rate greater than the predevelopment storm water flow rate, is deficient either from a safety, hydraulic, or erosion control standpoint, the developer shall - as determined by the City Engineer and consistent with any applicable Act 167 watershed plans - provide an appropriate detention facility, or upgrade the deficient storm water channel to the satisfaction of the City Engineer, or provide the City a monetary compensation according to the following formula:

- (1) Monetary compensation (in dollars) = 0.1 times the Area of additional impervious surfaces in square feet.
- (2) Monetary compensation collected herein shall be placed into a special escrow account of the City for the sole purpose of providing funds to finance construction work necessary to upgrade storm water drainage systems throughout the City.

(c) Storm Water Discharge Onto Adjacent Property

- (1) The existing points of concentrated drainage discharge onto adjacent property shall not be altered without written approval of the City Engineer.
- (2) Areas of existing diffused drainage discharge onto adjacent property shall be managed such that the peak diffused flow does not increase in the general direction of discharge, except as otherwise provided in this ordinance. If diffused flow is proposed to be concentrated and discharged onto adjacent property, the developer must document that there are adequate downstream conveyance facilities to safely transport the concentrated discharge or otherwise prove that no harm will result from the concentrated discharge. Areas of existing diffused drainage discharge

shall be subject to any applicable release rate criteria in the general direction of existing discharge whether they are proposed to be concentrated or maintained as diffused drainage areas.

(d) Storm Water Drainage Easement:

Where a subdivision is traversed by watercourses other than permanent streams, there shall be provided a drainage easement conforming substantially with the line of such watercourse. The width of the easement shall be adequate to provide for unimpeded flow of storm runoff based on calculations made in conformance with section 925.05 for the 100-year return period runoff and to provide a freeboard allowance of one-half (0.5) foot above the design water surface level. The terms of the easement shall prohibit excavation, the placing of fill, structures, plantings or any other alterations or obstructions which may adversely affect the flow of storm water within any portion of the easement. Also, periodic maintenance of the easement to ensure proper runoff conveyance shall be required.

(e) Street Drainage:

(1) General

Storm drainage systems shall, among other requirements, (a) ensure adequate drainage of all low points along the line of streets; (b) take surface water from the bottom of vertical grades, lead water from springs, and avoid excessive use of cross-gutters at street intersections and elsewhere; (c) provide for the eventual discharge of surface water away from the street rights-of-way; and (d) intercept storm water runoff along streets at intervals related to the extent and grade of the area drained.

(2) Inlets

- A. Inlets shall be designed and located to prevent hazardous conditions for vehicles, bicycles and pedestrians.
- B. Inlets shall be spaced to collect design flows from the catchment areas allowing 10% maximum bypass. In no instance shall inlet spacing be greater than 400 feet.

- C. Inlets shall be depressed appropriately below the grade of the gutter or ground surface.
- D. As a rule, inlets shall be either City Standard No. 9, 7 or 7A, or a curb-opening inlet approved by the City Engineer. PennDOT Type C inlet is generally not acceptable, unless specifically approved by the City Engineer.

(3) Drainage Onto State Highway

Any drainage facilities required by this ordinance that are located on a State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation.

(f) Storm Sewer Pipes

- (1) Generally, the minimum diameter of a storm sewer pipe shall be 18 inches. If considered hydraulically acceptable, the City Engineer may allow a smaller size storm sewer pipe for onsite drainage.
- (2) Generally, storm sewer pipes shall be watertight, o-ring joint, reinforced concrete pipe(RCP). The City Engineer may allow a plastic or other type of pipe under certain conditions.
- (3) Storm sewer pipe slopes shall be sufficient to provide a minimum velocity of flow of 2 feet per second for a 1-year storm. If feasible, the maximum velocity of flow shall be no more than 15 feet per second.
- (4) Where outlet velocities exceed five(5) feet per second, approved energy dissipators and/or outlet protection shall be designed and installed.

(g) Modification of Natural Drainage Swales

When it can be shown that, due to topographic conditions, natural drainage swales on the site cannot adequately provide for drainage, open channels - subject to the approval of the City Engineer - may be constructed conforming substantially to the line and grade of such natural drainage swales. The City Engineer may require an unexposed open channel(i.e. storm sewer pipe), if an exposed open channel places

nearby residences and their occupants at risks due to the volume and/or velocity of water flow in the channel. Should a storm sewer pipe be required, it shall be designed for a 25-year storm event unless other conditions in this ordinance require a greater capacity. In general, any unexposed open channel that receives storm water from an open swale and is greater than 200 feet in length shall have a trash rack, or other similar protective device, placed at its entrance. This trash rack or similar protective device shall protect persons from being inadvertently swept into the channel by hydraulic forces while the channel is carrying storm water. Capacities of open channels shall be calculated using the Manning equation or other acceptable engineering equation/method as approved by the City Engineer. (See definition of Open Channel.)

(h) Erosion Control

- (1) General - Erosion control plans shall be submitted with all site plans and the City Engineer may require approval of the erosion control plan by the Conservation District. Storm drainage facilities and appurtenances shall be so designed and provided as to minimize erosion, as well as damaging flooding conditions, in watercourse channels and at all points of discharge. The engineering design(s) for controlling runoff both during and after construction shall comply with the latest issue(as stated in the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works") of the PADER Erosion and Sedimentation Pollution Control Program Manual. Should the City Engineer determine that erosion control is deficient during construction, the City Engineer may pull all construction permits acquired from the City and - except for corrective erosion control work - stop the job until, in the opinion of the City Engineer, adequate correction of erosion control deficiencies has been made.
- (2) Residential - It is the intent of this ordinance to require that proper erosion control be maintained on all land regardless of the area of land intentionally disturbed(if any) and regardless of the status of any construction on the land. Should the City Engineer determine that erosion control on any area of land is deficient and impacting or threatening to impact on offsite land, either directly or indirectly(such as

through the creation of sinkholes that may travel offsite), the City Engineer may require that corrective action be taken in an expeditious manner. This corrective action shall be acceptable to the City Engineer and shall be completed as soon as possible, but no later than 10 days from the date of notification of the deficiency.

(i) Storm Water Volume Control

Where geology permits, consideration should be given to the design and use of volume controls for storm water management.

(j) Sinkhole Prevention

- (1) General - Unless a geological survey demonstrates the feasibility of encouraging storm water infiltration, grading shall be adequate to ensure the continuous flow of storm water across appropriate watercourses without excessive ponding or other conditions conducive to storm water infiltration and subsequent sinkhole formations.
- (2) Active Sinkhole or Land Subsidence - Any area of sinkhole activity or land subsidence shall be corrected in a reasonable period of time, and if such activity is impacting or threatens to impact offsite property (or a nearby street), the corrections shall be performed as soon as possible but no later than 10 days from the date of notification from the City Engineer. Such corrections shall be to the satisfaction of the City Engineer.

(k) Concrete Block Retaining Walls

- (1) General - Whereas it is recognized that the use of large heavy concrete blocks to construct retaining walls may pose a risk to adjacent property owners if improperly placed, and whereas the use of such blocks may result in the unsightly appearance of unlevel and irregular construction lines, the use of concrete blocks weighing more than 100 pounds each to construct such walls over two feet high shall be used only with the approval of the City Engineer. The City Engineer may require a P.E. certified (i.e. P.E. stamped) design of the wall. The City Engineer may impose restrictions on construction tolerances for out-of-level or out-

of-line layers, or impose restrictions on the height of the wall to ensure that the appearance of the wall is aesthetically acceptable.

- (1) NPDES Permit - For all activities that disturb more than five (5) acres of land, a NPDES permit application for discharge of storm water associated with construction activity shall be submitted to the Lehigh or Northampton County Conservation District, as applicable.

925.04 STORM WATER DETENTION

- (a) Storm water detention facilities shall be used whenever increased runoff from the land development would overload drainage systems or cause significant increases in flood levels in any watercourse downstream. This will be determined by comparing the increase in runoff caused by the land development with the existing runoff rates and capacity of downstream drainage systems and watercourses. This ordinance incorporates the basic requirements of the following county approved storm water management plans under Act 167: The Monocacy Creek Watershed Plan, The Nancy Run Watershed Plan, the Saucon Creek Watershed Plan, and the Catasauqua Creek and Lehigh River Sub-Basin 4 Watershed Plan. Any proposed land development within the City shall adhere to the detention/no detention requirements of the applicable watershed plan.
- (b) Whenever storm water detention facilities are required, the maximum post-development peak rates of flow shall be by the following provisions:
 - (1) Watersheds Under An Approved Act 167 Storm Water Management Plan

Within watersheds for which there is a county approved Act 167 Storm Water Management Plan, the detention facilities shall be designed to discharge post-development peak runoff rates consistent with the Plan criteria except in the instance of off-site detention facilities implemented in accordance with paragraph "(3)" below. In the event that the Act 167 plan indicates "Provisional No Detention", "Conditional No Detention I", or "Conditional No Detention II" for the area of development and the developer does not upgrade pertinent deficient storm water channels to standards of this ordinance or other valid alternatives, the developer shall - if

acceptable to the City Engineer - be allowed to pay a fee equivalent to the cost of detention as stipulated in section 925.03(b), unless the developer can unequivocally demonstrate that the downgradient storm sewer system can accommodate the increased flow rate of this development and all other potential runoff discharging into this storm sewer system, in accordance with sections 925.03(g), 925.03(h), 925.05(a), 925.06(c) and other no-harm requirements of this ordinance, down to the confluence of the Lehigh River.

(2) Watersheds Not Under An Approved Act 167 Storm water Management Plan

Within watersheds for which there is not a county approved Act 167 Storm water Management Plan, detention facilities shall be designed to provide that the peak rate of runoff at all points of discharge from the site, when developed, will not exceed the peak rate of runoff at each of those points prior to development for a two (2), ten (10), twenty-five (25), and one hundred (100) year storm, except in the instance of off-site detention facilities implemented in accordance with paragraph "(3)" below. Further, the City Engineer may impose more restrictive requirements on release rates when a valid engineering study indicates that more restrictive requirements are necessary to prevent a significantly detrimental increase in the peak flow rates at any point downstream (up to the confluence of the Lehigh River) from the point of discharge. In cases where a proposed land development cannot accommodate a detention facility, or if - in the opinion of the City Engineer - a detention facility is not feasible nor a significantly useful storm water management tool, the developer may - at the discretion of the City Engineer - request to upgrade a deficient storm water channel, or pay a fee, equivalent to the cost of detention, in lieu of detention as stipulated in section 925.03(b), unless the developer can unequivocally demonstrate that the downgradient storm sewer system can accommodate the increased flow rate of this development and all other potential runoff discharging into this storm sewer system, in accordance with sections 925.03(g), 925.03(h), 925.05(a), 925.06(c) and other no-harm requirements of this ordinance, down to the confluence of the Lehigh River.

(3) Regional Detention Facilities

In certain instances, regional detention facilities to provide runoff control for multiple development sites may be implemented in lieu of individual development site detention basins. Peak runoff rates of discharge from a regional detention basin shall be based upon maintaining existing peak runoff rates for the tributary area, except that other criteria for discharge may apply for regional detention facilities located within a watershed with a county approved Act 167 Storm Water Management Plan. Any developer relying upon regional detention facilities in lieu of on-site controls shall pay an appropriate fee to the owner of the regional facility. Any proposed regional detention facility shall have the approval of the Joint Planning Commission as well as the City Engineer.

(c) Provisions of Detention Facilities

Where detention facilities are included as part of the storm drainage system, the following provisions will apply:

- (1) Detention ponds shall be designed so that they return to normal conditions within approximately twelve (12) hours after the termination of the storm, unless the City Engineer finds that downstream conditions may warrant other design criteria for storm water release.
- (2) The developer shall demonstrate that such ponds are designed, protected and located to assure that public safety is maximized and health problems are prevented. Certain protective devices and/or screenings such as fencing and landscaping may be required at the discretion of the City Engineer or Planning Commission. The depth of the detention facility and the location of the facility in conjunction with the surrounding structures shall be taken into account when considering the need for the above improvements.
- (3) The developer shall verify that the operation of the detention facilities will not aggravate potential downstream peaking conditions, unless the detention facilities have been designed in accordance with an approved Act 167 Storm Water Management Plan for the applicable watershed.

- (4) All storm water detention facilities shall provide a minimum 1.0 foot freeboard, measured to the invert of the emergency spillway, above the maximum pool elevation associated with the 2 through 25-year runoff events. A designed concrete outlet structure shall be provided, and the 2- to 100-year storm events shall be controlled by the outlet structure. Also, a designed emergency spillway shall be provided to pass the 100-year runoff event with a minimum 0.5 foot freeboard measured to the top of the basin should the designed outlet structure become completely obstructed. Overflow through the emergency spillway shall be controlled to prevent property damage. If this facility is considered to be a dam as per DEP Chapter 105, the design of the facility must be consistent with the Chapter 105 regulations, and may be required to pass a storm greater than the 100-year event. The City Engineer may allow some relief from the freeboard requirements, depending upon construction methods and other extenuating circumstances.
- (5) A subsurface soils investigation satisfactory to the City Engineer and with special emphasis on identifying sinkholes shall be performed.
- (6) If in the opinion of the City Engineer the seasonal high groundwater table is within five feet of the bottom elevation of the detention pond, then a valid engineering study shall demonstrate the actual high groundwater elevation and any impact that it may have on the performance of the detention pond.
- (7) The bottom of the pond shall be sloped toward the outlet structure a minimum of 1%. Generally, the side slopes of the pond shall be no steeper than 4 units horizontal to 1 unit vertical.
- (8) All construction joints are to be watertight.
- (9) Unless a geological survey demonstrates the feasibility of encouraging infiltration in a detention pond, the detention pond shall, generally, be lined with a full 6-inch thick clay liner with a permeability of 1×10^{-7} cm/sec. or less. The City Engineer may require a full 12-inch thick clay liner with a permeability of 1×10^{-7} cm/sec. or less, where circumstances such as water depth or nearby utilities necessitate a

greater degree of assurance against the formation of sinkholes. Also, the City Engineer may approve a different liner system that is - in the opinion of the City Engineer - equal to or better than the above mentioned liners. This clay liner shall, in turn, be covered by a 6-inch layer of viable topsoil on which a healthy growth of grass shall be established (unless rip-rapped). This liner system shall extend from the bottom of the pond to the elevation of the emergency spillway. The liner permeability of 1×10^{-7} cm/sec. shall be verified by lab tests on three field samples or other equivalent procedure acceptable to the City Engineer. Additional tests may be required by the City Engineer should any of the three original tests yield unacceptable results. All the testing shall be arranged and paid by the developer; however, the testing lab shall be certified in this area of testing and acceptable to the City Engineer.

- (10) Complete details and sections shall be provided for the outlet structure and only concrete outlet structures are allowed. A sectional view is also required for the spillway. A detail of an anti-seep collar around the outlet pipe may also be required.
- (11) Any detention pond intended to meet the requirements of this ordinance which requires a Dam Safety Permit from the PADER shall be designed consistent with the provisions of the Dam Safety and Encroachments Act and the PADER Chapter 105 Rules and Regulations.
- (12) Compatibility with NPDES Requirements - Any proposed Regulated Activity for which a permanent storm water quality control detention basin is required under the NPDES regulations shall use the more stringent runoff control criteria between this Ordinance and the NPDES requirements.

925.05 CALCULATIONS OF RUNOFF AND DESIGN STORM FREQUENCY

- (a) Storm drainage systems required by this ordinance shall be designed to provide protection from a twenty-five (25) to one hundred (100) year storm as determined by the City Engineer. For those portions of the City within watersheds which have a county approved Act 167 Storm Water Management Plans, the criteria within the applicable plan shall be used except that the storm

drainage system shall at least be adequate for a twenty-five year (25) storm event. A one hundred (100) year design storm is required where a storm of this return period would likely cause damage to existing or future structures or their contents were it not for implementation of proper storm water management provisions.

- (b) Storm water runoff from watersheds of one hundred (100) or less acres may be calculated by the rational method as described in the latest manual of the American Society of Civil Engineers, appropriate to this topic, as stated in the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works".
- (c) All calculations using the Rational Method shall use rainfall intensities consistent with appropriate return periods and the Intensity-Duration-Frequency Curves in accordance with the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works."
- (d) Runoff coefficients for use in the Rational Method shall be in accordance with the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works," unless in the opinion of the City Engineer, a more conservative set of runoff coefficients are necessary to prevent the exacerbation of existing downstream storm water deficiencies.
- (e) Storm water runoff from watersheds of more than one hundred(100) acres shall be calculated using the soil-cover-complex method developed by the Soil Conservation Service or other appropriate method acceptable to the City Engineer.
- (f) All calculations using the soil-cover-complex method shall use the Soil Conservation Service Type II 24-hour rainfall distribution. The 24-hour rainfall depths for the various return periods shall be from the current issue of the PennDOT Intensity - Duration - Frequency Field Manual for Region 4, as indicated in the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works."
- (g) Runoff Curve Numbers (CN's) to be used in the soil-cover-complex method shall be in accordance with the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works."

- (h) The design of the detention facility shall be verified by routing the proposed post-development hydrograph through the pond using a storage indication technique. For basins designed using the rational method technique, the design hydrograph for routing shall be either the Universal Rational Hydrograph or the modified rational method trapezoidal hydrograph which maximizes detention volume.
- (i) The Manning equation shall be used in calculating capacities of watercourses and storm sewers. Culverts shall be designed using standard engineering methods acceptable to the City Engineer. Manning 'n' values used in the calculations shall be in accordance with the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works," or otherwise provided by the City Engineer.
- (j) Calculations shall show and quantify the area of additional impervious surfaces.
- (k) Complete detailed drainage calculations and applicable charts and nomographs certified(i.e. P.E. Stamp) by the design engineer shall be submitted to the City Engineer.

925.06 STORM WATER MANAGEMENT DISTRICTS

(a) Mapping of Storm Water Management Districts

In order to implement the provisions of all county approved Act 167 Storm Water Management Plans in the City of Bethlehem, the City is divided into Storm Water Management Districts of the Monocacy Creek, Nancy Run, and Saucon Creek, and the Catasauqua Creek and Lehigh River Sub-Basin 4 Watersheds. The boundaries of the Storm Water Management Districts are shown on an official map which is available for inspection at the City Engineer's office.

(b) Description of Storm Water Management Districts

Five types of Storm Water Management District may be applicable namely Single Release Rate Districts, Provisional No Detention Districts and Dual Release Rate Districts as described below.

- (1) Single Release Rate Districts - There are six single release rate districts which differ in the extent to which post-development runoff must be controlled. The release rates, and districts, are

50%, 60%, 70%, 80%, 90% and 100%. Within a given district, the postdevelopment peak rate of storm runoff must be controlled to the stated percentage of the predevelopment peak rate of storm runoff in order to protect downstream watershed areas.

- (2) Provisional No Detention Districts - These watershed areas may discharge post-development peak runoff without detention facilities without adversely affecting the total watershed peak flow. In certain instances, however, the "local" runoff conveyance facilities, which transport runoff from the site to the main channel, may not have adequate capacity to safely transport increased peak flows associated with not providing detention for a proposed development. In those instances, the developer shall either use a 100% release rate control or provide increased capacity of downstream drainage elements to convey increased peak flows consistent with paragraph "(9)" of section 925.06(c). In determining if adequate capacity exists in the local watershed drainage network, the developer must assume that the entire local watershed is developed per current zoning and that all new development would use the runoff controls specified by this ordinance. Similarly, any capacity improvement must be designed to convey runoff from development of all areas tributary to the improvement consistent with the capacity criteria specified in paragraph "(9)" of section 925.06(c) and in section 925.05(a).
- (3) Conditional No Detention I Districts - Within these districts, the capacity of the "local" runoff conveyance facilities (as defined in Article II) must be calculated to determine if adequate capacity exists. For this determination, the developer must calculate peak flows assuming that the site is developed as proposed and that the remainder of the local watershed is in the existing condition. The developer must also calculate peak flows assuming that the entire local watershed is developed per current zoning and that all new development would use the runoff controls specified by this Ordinance. The larger of the two peak flows calculated will be used in determining if adequate capacity exists. If adequate capacity exists to safely transport runoff from the site to the main channel (as defined in Article II), these watershed areas may discharge post-development peak runoff without

detention facilities. If the capacity calculations show that the "local" runoff conveyance facilities lack adequate capacity, the developer shall either use a 100% release rate control or increase the capacity of downstream elements to convey increased peak flows consistent with Sections 925.05(a) and 925.06(c)(3). Any capacity improvements must be designed to convey runoff from development of all areas tributary to the improvement. By definition, a storm drainage problem area associated with the "local" runoff conveyance facilities indicates that adequate capacity does not exist.

- (4) Conditional No Detention II Districts - Within these districts, the capacity of the "local" runoff conveyance facilities must be calculated in the same manner as the Conditional No Detention I Districts. In this case, however, adequate capacity must be demonstrated from the site to the Lehigh River. After determining if adequate capacity exists, the developer shall use no detention, a 100% release rate, or provide capacity improvements as detailed in Section 925.06(b)(3)-Conditional No Detention I Districts.
- (5) Dual Release Rate Districts - The anticipated post-development runoff from these areas can only be controlled across the range of return periods from 2 through 100 years by implementing a dual system of release rates. Within the Monocacy Creek Watershed, this system is designated as 30%/100% release rate criteria. Within this district of this watershed, the 2-year postdevelopment runoff must be controlled to 30% of the predevelopment 2-year runoff peak. Further, the 10-year, 25-year and 100-year postdevelopment runoff must be controlled to 100% of the predevelopment peak.

Within this district of the Saucon Creek, the Catasauqua Creek, and the Lehigh River Sub-Basin 4 Watersheds, the 2-year postdevelopment runoff must be controlled to 30% of the predevelopment 2-year runoff peak. Further, the 10-year, 25-year and 100-year postdevelopment runoff must be controlled to the stated percentage(s) of the predevelopment peak. Release rates associated with the 10-through 100-year events vary from 50% to 100% depending upon the location in the watershed.

(c) Storm Water Management District Implementation Provisions

- (1) Any storm water management controls required by this ordinance and subject to single release rate criteria (50% through 100%) shall meet the applicable release rate criteria for each of the 2-, 10-, 25- and 100-year return period runoff events consistent with the calculation methodology specified in section 925.05. Storm water management controls intended to meet the Dual Release Rate (30%/100%) criteria shall also be designed consistent with section 925.05.
- (2) The exact location of the Storm Water Management District boundaries as they apply to a given development site shall be determined by mapping the boundaries using the two-foot topographic contours provided as part of the Drainage Plan. The District boundaries as originally drawn coincide with topographic divides or, in certain instances, are drawn from the intersection of the watercourse and a physical feature (such as the confluence with another watercourse or a potential flow obstruction e.g. road, culvert, bridge, etc.) to the topographic divide.
- (3) Any downstream capacity analysis conducted in accordance with this ordinance shall use the following criteria for determining adequacy for accepting increased peak flow rates, except as may be modified by section 925.05(a):
 - A. Natural or man-made channels or swales must be able to convey the increased runoff associated with a 10-year return period event within their banks at velocities consistent with protection of the channels from erosion. Acceptable velocities shall be based upon criteria included in the latest issue(as stated in the most up-to-date issue of the "Storm Water Design Policy Manual of the Department of Public Works") of the PADER Erosion and Sedimentation Pollution Control Program Manual.
 - B. Natural or man-made channels or swales must be able to convey the increased 25-year return period runoff peak within their banks or otherwise not create any hazard to persons or property.

C. Culverts, bridges, storm sewers or any other facilities which must pass or convey flows from the tributary area must have sufficient capacity to pass or convey the increased flows associated with the 25-year return period runoff event, except for facilities located within a designated floodplain area which must be capable of passing or conveying the 100-year return period runoff. Any facilities which constitute stream enclosures per PADER's Chapter 105 regulations shall be designed to convey the 100-year return period runoff.

(4) Development within only one release rate category area

For a proposed development site located within only one release rate category area, the total runoff from the site shall meet the applicable release rate criteria. For development sites with multiple points of concentrated runoff discharge, individual drainage points may be designed for up to a 100% release rate so long as the total runoff from the site is controlled to the applicable release rate.

(5) Development within two or more release rate category areas

For a proposed development site located within two or more release rate category areas, the maximum peak rate of runoff that may be discharged at any point is limited to the predevelopment peak rate of runoff at the point multiplied by the applicable release rate. The control rates shall apply regardless of any grading modifications which may change the drainage area which discharges at a given point.

(6) Development partially within a release rate category area and partially within a Provisional No Detention, Conditional No Detention I, or Conditional No Detention II District

For proposed development sites located partially within a release rate category area and partially within a provisional no detention area, in no event shall a significant portion of the site area subject to the release rate control be drained to the discharge point(s) located in the no detention

area.

- (7) "No Harm" Option - For any proposed development site not located in a provisional no detention district, the developer has the option of using a less restrictive runoff control (including no detention) if the developer can prove that "no harm" would be caused by discharging at a higher runoff rate than that specified by the Plan. Proof of "no harm" would have to be shown from the development site through the remainder of the downstream drainage network to the confluence of the watershed with the Lehigh River. Proof of "no harm" must be shown using the capacity criteria specified in section 925.06(c), if downstream capacity analysis is a part of the "no harm" justification.

Attempts to prove "no harm" based upon downstream peak flow versus capacity analysis shall be governed by the following provisions:

- A. The peak flow values to be used for downstream areas for the design return period storms (2-, 10-, 25- and 100- year) shall be the values from the calibrated Penn State Runoff Model for the applicable watershed, or the peak flow rate values from the PSU-IV model if applicable. These flow values are available from the Lehigh Valley Planning Commission.
- B. Any available capacity in the downstream conveyance system as documented by a developer may be used by the developer only in proportion to his development site acreage relative to the total upstream undeveloped acreage from the identified capacity (i.e. if his site is 10% of the upstream undeveloped acreage, he may use up to 10% of the documented downstream available capacity).
- C. Developer-proposed runoff controls which would generate increased peak flow rates at documented storm drainage problem areas would, by definition, be precluded from successful attempts to prove "no harm", except in conjunction with proposed capacity improvements for the problem areas consistent with paragraph (9) of section 925.06(c).

The developer shall submit any "no harm" justifications concurrently to the Joint Planning Commission and the City Engineer for review as part of the Drainage Plan submission per section 925.07. Any extra submission costs resulting from the dual submission and review shall be borne by the developer. The developer completely assumes all risks in so much that the submission of "no harm" requires a rigorous review for its approval and this approval is not guaranteed.

- (8) Regional or Sub-Regional Detention Alternatives - For certain areas within the watershed, it may be more cost-effective to provide one control facility for an entire subarea, group of subareas, or portion of a subarea incorporating more than one development site than to provide an individual control facility for each development site. The initiative and funding for any regional or sub-regional runoff control alternatives are the responsibility of prospective developers. The design of any regional control basins must incorporate reasonable development of the entire upstream watershed. The peak outflow of a regional basin would be determined on a case-by-case basis using the hydrologic model of the watershed consistent with protection of the downstream watershed areas. "Hydrologic model" refers to the calibrated applicable watershed version of the Penn State Runoff Model or PSU-IV Model as developed for the Storm Water Management Plan.
- (9) Capacity Improvements - In certain instances, primarily within the provisional no detention areas, local drainage conditions may dictate more stringent levels of runoff control than those based upon protection of the entire watershed. In these instances, if the developer could prove that it would be feasible to provide capacity improvements to relieve the capacity deficiency in the local drainage network, then the capacity improvements could be provided by the developer in lieu of runoff controls on the development site. Any capacity improvements would be designed based upon development of all areas tributary to the proposed improvement and the capacity criteria specified in section 925.05(a) and paragraph "(3)" of section 925.06(c). In addition, all new development upstream of a proposed capacity

improvement shall be assumed to implement the applicable runoff controls consistent with this ordinance except that all new development within the entire subarea(s) within which the proposed development site is located shall be assumed to implement the developer's proposed discharge control, if any.

Capacity improvements may also be provided as necessary to implement any regional or subregional detention alternatives or to implement a modified "no harm" option which proposes specific capacity improvements to document the validity of a less stringent discharge control which would not create any harm downstream.

925.07 DRAINAGE PLAN REQUIREMENTS AND PROCEDURES

(a) General

For any of the regulated activities of this ordinance, prior to the final approval of subdivision and/or land development plans, or the issuance of any permit, or the commencement of any land disturbance activity, the owner, subdivider, developer or his agent shall submit a Drainage Plan for approval.

(b) Drainage Plan Format

The following shall be the format of the drainage plans to be reviewed by the City Engineer or his designee:

(1) General

General description of proposed permanent storm water controls. All existing drainage features which are to be incorporated in the design shall be so identified. If the development is to occur in stages, a general drainage plan for the entire development shall be presented with the first stage and appropriate development stages for the drainage system shall be indicated.

(2) Items to be included on maps(s) of the project area

A. The location of the project relative to highways, City boundary lines or other identifiable landmarks and existing structures.

- B. The watershed area or areas including existing and proposed contours in which the proposed development is located. Existing and proposed contours shall be shown at intervals of two (2) feet. In areas of steep slopes (greater than 15%), five-foot contour intervals may be used. Scale shall be 1" = 40' or 1" = 30'.
- C. Clear delineation of all pertinent drainage areas and their main time of concentration(T_c) flow paths. The flow paths shall be segmented by sheet flow(limited to 100 feet), shallow flow, and open channel flow, all in accordance with TR55, of the Soil Conservation Service(SCS). A summary table shall clearly show the acreage, T_c , Runoff Curve Number(RCN), Hydrologic Soil Group(HSG), percent impervious cover, the applicable storm water management district release rate(s), and, if using the Rational Method, the weighted coefficient of runoff(C_w) and storm intensity factor(I) for the pre and postdevelopment conditions of all the pertinent drainage areas for the 2, 10, 25, and 100 year return period storm.
- D. Calculations of runoff before and after development for all points of runoff concentration.
- E. Streams, lakes, ponds or other bodies of water within the project area.
- F. Other physical features including existing drainage swales and areas of natural vegetation to be preserved.
- G. Locations of proposed underground utilities, sewers and water lines, and easements thereof.
- H. An overlay showing soil types and boundaries.
- I. Proposed changes to land surface and vegetative cover.
- J. Proposed structures, roads, and paved areas.
- K. Storm Water Management District boundaries and corresponding release rate(s) applicable

to the site.

(3) Storm Water Management Controls

- A. All storm water management controls, including the following items, must be shown on the submitted plans:
 - 1. Groundwater recharge methods such as seepage pits, beds or trenches. When these structures are used, the locations of septic tank infiltration areas and wells must be shown.
 - 2. Other control devices or methods such as roof-top storage, semi-pervious paving materials, grass swales, parking lot ponding, vegetated strips, detention or retention ponds, storm sewers, etc.
- B. All calculations, assumptions and criteria used in the design of the control device or method must be shown.

(4) Maintenance Program - A maintenance program for all storm water management control facilities must be included. This program must include the proposed ownership of the control facilities, the maintenance requirements for the facilities, and the financial responsibilities for the required maintenance.

(5) Plan Notes

A. Detention Pond Liner Note

The following note regarding the specification of the detention pond liner shall be included on the plans, whenever a detention pond is required:

"Unless a geological survey demonstrates the feasibility of encouraging infiltration in a detention pond, the detention pond shall, generally, be lined with a full 6-inch thick clay liner with a permeability of 1×10^{-7} cm/sec. or less. This clay liner shall, in turn, be covered by a 6-inch layer of viable topsoil on which a healthy growth of grass shall be established(unless rip-rapped). This liner system shall extend from the

bottom of the pond to the elevation of the emergency spillway. The liner permeability of 1×10^{-7} cm/sec. shall be verified by lab tests on three field samples or other equivalent procedure acceptable to the City Engineer. Additional tests may be required by the City Engineer should any of the three original tests yield unacceptable results. All the testing shall be arranged and paid by the developer; however, the testing lab shall be certified in this area of testing and acceptable to the City Engineer."

The City Engineer may require a full 12-inch thick clay liner with a permeability of 1×10^{-7} cm/sec. or less, where circumstances such as water depth or nearby utilities necessitate a greater degree of assurance against the formation of sinkholes. Also, the City Engineer may approve a different liner system that is - in the opinion of the City Engineer - equal to or better than the above mentioned liners.

B. Pond cleanout at the end of construction

The following note shall be included in the erosion control section of the plans whenever a detention pond is utilized as a sedimentation pond during construction:

"The Contractor shall clean all accumulated sediment and silt from the pond at the end of the construction, and return the pond to its original design condition."

C. Maintenance Note

The following note regarding maintenance of the storm water facilities shall be included on the plans unless these facilities are dedicated to the City in accordance with section 925.10(b) of this ordinance:

"The maintenance of the storm water facilities, including the detention pond, shall be the owner's responsibility. The owner's deed, and the deeds to any subsequent owner, shall note that the owner shall accept the maintenance responsibilities. The City of Bethlehem shall be permitted to inspect

the storm water facilities on at least an annual schedule to ensure that any necessary corrective work is performed in a timely manner."

D. As-built Note

The following note regarding as-built records shall be included on the plans:

"The developer shall ensure that current as-built records are maintained during construction. Upon completion of construction, Certified(i.e. P.E. Stamped) as-built drawings shall be submitted by the developer's engineers. These as-built drawings shall be found acceptable by the City Engineer prior to release of any remaining security."

E. Revision Note

The following note regarding future revisions to the plans shall be included on the plans upon initial submission:

"In order to maintain continuity between plan revisions, any changes to a previous plan submission shall be flagged with a triangle. Any changes not flagged may be considered not approved. Flagged changes shall be referenced to the appropriate revision date."

(c) Plan Submission

- (1) For regulated activities specified in sections 925.01(a) & (b), the Drainage Plan shall be submitted by the developer at the Preliminary Plan stage to the following parties:
 - A. Two(2) copies to the Planning Bureau of the City of Bethlehem[One(1) of these copies will be forward to the City Engineer].
 - B. One(1) copy to the Lehigh Valley Planning Commission.
- (2) For regulated activities specified in subsections "c, d, e, f, g, & h" of section 925.01, the Drainage Plan shall be submitted by the developer to the City building permit officer as part of the

building permit application. The building permit officer will then confer as necessary with the City Engineer on the Drainage plan.

- (3) For regulated activities specified in section 925.01(i) & (j), the Drainage Plan shall be submitted by the developer to the Lehigh Valley Planning Commission for coordination with the PADER permit application process under Chapter 105 (Dam Safety and Waterway Management) or Chapter 106 (Flood Plain Management) of PADER's Rules and Regulations.

(d) Drainage Plan Review

- (1) The City Engineer shall review the Drainage Plan for consistency with the adopted applicable Storm Water Management Plan as embodied by this ordinance and against any additional storm drainage provisions contained in the City subdivision and land development or zoning ordinance, as applicable.
- (2) The Lehigh Valley Planning Commission shall provide an advisory review of the Drainage Plan for consistency with the applicable Storm Water Management Plan.
- (3) For activities specified in sections 925.01(a) & (b), the Lehigh Valley Planning Commission shall provide written comments to the City, within a time frame consistent with established procedures under Act 247, as to whether the Drainage Plan has been found to be consistent with the Storm Water Management Plan.
- (4) For activities specified in sections 925.01(i) & (j), the Lehigh Valley Planning Commission shall notify PADER whether the Drainage Plan is consistent with the Storm Water Management Plan and forward a copy of the review letter to the City and developer.
- (5) The City may not approve any subdivision, land development, or building permit application, if the Drainage Plan is not in compliance with this ordinance as determined by the City Engineer.

(e) Modification of the Plans

A modification to a submitted Drainage Plan for a

proposed development site which involves a change in control methods or techniques, or which involves the relocation or redesign of control measures, or which is necessary because soil or other conditions are not as stated on the Drainage Plan (as determined by the City Engineer) shall require a resubmission of the modified Drainage Plan consistent with sections 925.07(b) and (c), subject to review per section 925.07(d).

(f) Hardship Waiver Procedure

- (1) The City Planning Commission may hear requests for waivers where it is alleged that the provisions of this (Act 167) ordinance inflict unnecessary hardship upon the applicant. The waiver request shall be in writing and accompanied by a \$1000.00 fee. A copy of the written request shall be provided to the City Engineer. Assistance may be requested from City Solicitor and other sources as required. The application shall fully document the nature of the alleged hardship.
- (2) The City Planning Commission may grant a waiver provided that all of the following findings are made in a given case:
 - A. That there are unique physical circumstances or conditions, including irregularity of lot size or shape, or exceptional topographical or other physical conditions peculiar to the particular property, and that the unnecessary hardship is due to such conditions, and not the circumstances or conditions generally created by the provisions of this ordinance in the Storm Water Management District in which the property is located;
 - B. That because of such physical circumstances or conditions, there is no possibility that the property can be developed in strict conformity with the provisions of this ordinance, including the "no harm" provision, and that the authorization of a waiver is therefore necessary to enable the reasonable use of the property;
 - C. That such unnecessary hardship has not been created by the applicant; and
 - D. That the waiver, if authorized, will represent the minimum waiver that will afford

relief and will represent the least modification possible of the regulation in issue, as determined by the City Engineer.

- (3) In granting any waiver, the City may attach such reasonable conditions and safeguards as it may deem necessary to implement the purposes of Act 167 and this ordinance, including the requirement of a fee in lieu of detention as stipulated in section 925.03(b). The City shall not grant any waiver which would result in conditions hazardous to persons or conducive to property damage, or which would significantly increase an existing potential for property damage, or which would significantly increase an already hazardous condition to persons.

925.08 INSPECTIONS

- (a) The City Engineer or his designee shall be permitted to inspect all phases of the installation of the permanent storm water control facilities and the completed installation. The City Engineer or his designee may also check that as-built records are being maintained onsite.
- (b) If at any stage of the work the City Engineer determines that the permanent storm water control facilities are not being installed in accordance with the approved development plan, the City may revoke any existing permits, acquired from the City, until acceptable implementation of the approved development plan - as determined by the City Engineer - is made.

925.09 FEES AND EXPENSES

The applicant shall sign an agreement to pay for fees and expenses established by the City of Bethlehem to compensate the City for the cost incurred during the review and processing of the Drainage Plan. The fees and expenses shall, at a minimum, cover the following:

- (a) The review of the Drainage Plan by the City Engineer or his representative.
- (b) Site inspections and necessary testing, including but not limited to the following:
 - (1) The inspection of required controls and improvements during construction.

- (2) The final inspection upon completion of the controls and improvements required in the plan.
- (c) Any additional work required to enforce any permit provisions regulated by this ordinance, correct violations, and assure the completion of stipulated remedial actions.

Each applicant shall receive an invoice which explains the labor, material, and equipment cost at the conclusion of the review and processing.

925.10 MAINTENANCE RESPONSIBILITIES

The maintenance responsibilities for permanent storm water runoff control facilities shall be determined based upon the type of ownership of the property which is controlled by the facilities.

(a) Single Entity Ownership

In all cases where the permanent storm water runoff control facilities are designed to manage runoff from property in a single entity ownership as defined below, the maintenance responsibility for the storm water control facilities shall be with the single entity owner. The single entity owner shall enter into an agreement with the City which specifies that the owner or future owner will properly maintain the facilities consistent with accepted practice as determined by the City Engineer. The agreement shall provide for regular inspections by the City and contain such provisions as necessary to ensure timely correction of any maintenance deficiencies by the single entity owner. A single entity shall be defined as an individual, association, public or private corporation, partnership firm, trust, estate or any other legal entity empowered to own real estate.

(b) Multiple Ownership

In cases where the property controlled by the permanent storm water control facilities shall be in multiple ownership (i.e. many individual owners of various portions of the property), the developer may, with the approval of the City, dedicate the permanent storm water control facilities to the City for maintenance. The developer shall then provide a one time fee to the City to provide for maintenance of the facility in perpetuity. This fee shall be based on a reasonable estimate of the projected costs to maintain the

facility, so that these projected costs can be completely paid by the interest earned on the one time fee. This fee shall be placed into a special escrow account to be used, at the approval of the City Engineer, solely for storm water management purposes. Should dedication of the storm water control facilities to the City not be approved, the developer shall provide other arrangements - acceptable to the City Engineer and the City Solicitor - to guarantee the maintenance of these facilities.

In certain multiple ownership situations, it may be beneficial to transfer the maintenance responsibility to an individual or group of individuals residing within the controlled area. These individuals may have the permanent storm water control facilities adjacent to their lots or otherwise have an interest in the proper maintenance of the facilities. In these instances, the individual(s) may enter into a formal agreement with the City for the maintenance of the facilities. The City shall have the option of maintaining ownership of the facilities and the responsibility for periodic inspections.

925.11 RIGHT OF ENTRY

Upon presentation of the proper credentials, duly authorized representatives of the City may enter at reasonable times upon any property within the City to investigate or ascertain whether proper maintenance is being provided for any public or private storm water management facility.

925.99 PENALTY

(a) Any person who violates any provision of this Article shall be subject to the following penalties:

- (1) First violation - A fine of \$200.00, or thirty days imprisonment, or both;
- (2) Second violation - A fine of \$500.00, or sixty days imprisonment, or both;
- (3) Third and each subsequent violation - A fine of \$1,000.00, or ninety days imprisonment, or both.

(b) This Article and the foregoing penalties shall not be construed to limit or deny the right of the City or any person to such equitable or other remedies as may otherwise be available with or without process of law,

including payment of damages to the City by any person causing damage or injury to the City's storm sewer system. (Ord. 3029. Passed 10/15/85; Ord. 3242. Passed 2/7/89; Ord. 3476. Passed 5/5/92; Ord. 3876. Passed 3/17/98.)